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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/827,014 | 04/05/2001 | Sylvia Adae-Amoakoh | END920000149 US1 | 5720 |

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ARLEN L. OLSEN
SCHMEISER, OLSEN & WATTS
3 LEAR JET LANE
SUITE 201
LATHAM, NY 12110

EXAMINER

ANDUJAR, LEONARDO

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2826

DATE MAILED: 04/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/827,014

Applicant(s)

ADAE-AMOAKOH ET AL.

Examiner

Leonardo Andújar

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 April 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 10-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Acknowledgment

1. The response for reconsideration filed on 04/07/2003, paper no. 8, in response to the Office action mailed on 02/26/2003 has been entered. The present Office action is made with all the suggested amendments being fully considered. Accordingly, pending in this Office action are claims 1-20.

Election/Restrictions

2. This application contains claims 10-19 drawn to an invention nonelected with traverse in Paper No. 4. A complete reply to the final rejection must include cancelation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-6, 9 and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Takubo et al. (US 6,329,610)

5. Regarding claim 1, Takubo (e.g. fig. 3) shows an electronic structure comprising:

Art Unit: 2826

- A substrate having a dielectric layer 22 between a first metal layer 14a and a second metal layer 13a;
- A contact area located in the first metal layer (the region in contact with the layer 33);
- A selected area located on the second metal layer (the area around the through hole);
- A microvia cavity located within the selected area and extending through the second metal layer and the dielectric layer;
- And a mass of single conductive material 33 forming a layer upon the selected area of the second metal layer and totally filling the microvia cavity and being in contact with the first contact area of the first metal layer.

6. The second metal layer is located above the first metal layer. Also, the selected area is disposed above the first contact area.

7. Regarding claim 2, Takubo shows that the mass of the single conductive material conformally fills the microvia cavity.

8. Regarding claim 3, Takubo shows that the mass of the single conductive material has a planar surface forming a contact pad. The contact pad is located parallel to the first metal layer. Also, the contact pad is located opposite to the first contact area of the first metal layer.

9. Regarding claim 4, Takubo shows that the selected area is approximately centered around the microvia cavity.

Art Unit: 2826

10. Regarding claims 5 and 6, Takubo shows that the second metal layer within the selected area is approximately centered around the microvia cavity.

11. Regarding claim 9, Takubo discloses that the mass of the single material comprises a conductive paste (col. 16/lis. 29-30).

12. Regarding claim 20, Takubo (e.g. fig. 2) shows an assembly:

- A semiconductor chip 41 having a circuit;
- A substrate having a dielectric layer 22 between a first metal layer 14a and a second metal layer 13a;
- A contact area located in the first metal layer (the region in contact with the layer 33);
- A selected area located on the second metal layer (the area around the through hole);
- A microvia cavity located within the selected area and extending through the second metal layer and the dielectric layer;
- And a mass of a single conductive material 33 forming a layer upon the selected area of the second metal layer and totally filling the microvia cavity and being in contact with the first contact area of the first metal layer.

13. The second metal layer is located above the first metal layer and the selected area is disposed above the first contact area. Also, the semiconductor chip is electrically connected to the mass of the conductive material.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

16. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takubo et al. (US 6,329,610) in view of Sasaoka et al. (US 6,010,769).

17. Regarding claim 7, Takubo teaches that the second metal layer contains a flat copper land around the microvia (e.g. fig. 3; col. 15/lls. 50-51). Although it is well known in the art the benefits of using a ring shaped land Takubo does not explicitly disclose it. However, this limitation is considered an obvious design choice. Design choice limitations are not patentable unless unobvious or unexpected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note *In re Leshin*, 125 USPQ 416. For example,

Art Unit: 2826

Sasaoka discloses that via lands having a ring shape can release the normal line stress acting on a conductive pillar in its axial direction. Thereby, the breakage of via connection is prevented (e.g. fig. 2; col. 27, 28 and 37). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the flat copper land disclosed by Takubo having a ring shape in order to prevent the breakage of via connection as suggested by Sasaoka.

18. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takubo et al. (US 6,329,610) in view of Kawasaki (US 5,372,666).

19. Regarding claim 8, Takubo disclose that it is known in the art that vias can be made having truncated cone shape (e.g. figs. 10 and 12). In any case, the hole shape, absent any criticality, is only considered to be an obvious modification of the shape of the via hole disclosed by Prior Art as the courts have held that a change in shape or configuration, without any criticality, is within the level of skill in the art as the particular shape claimed by applicant is nothing more than one of numerous shapes that a person having ordinary skill in the art will find obvious to provide using routine experimentation based on its suitability for the intended use of the invention. See *In re Dailey*, 149 USPQ 47 (CCPA 1976). For example, Kawasaki discloses that vias having truncated cone shape can be filled with a conductive material without trapping air, thereby forming a via which has a good conductivity (col. 3/lls. 41-47). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the via disclosed by Takubo having a truncated cone shape in order to form a via having a

good conductivity since vias having this shape can be filled with conductive material without trapping air as taught by Kawasaki.

Response to Arguments

20. Applicant's arguments, see page 5, filed on 04/07/2003, with respect to the rejection(s) of claim(s) 1 and 20 under U.S.C. 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art.

Conclusion

21. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

22. Papers related to this application may be submitted directly to Art Unit 2826 by facsimile transmission. Papers should be faxed to Art Unit 2826 via the Art Unit 2826 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must

Art Unit: 2826

conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2826 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2826 Fax Center is to be used only for papers related to Art Unit 2826 applications. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Leonardo Andújar** at **(703) 308-0080** and between the hours of 9:00 AM to 6:00 PM (Eastern Standard Time) Monday through Friday (with alternated Fridays off) or by e-mail via Leonardo.Andujar@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn, can be reached on (703) 308-6601.

23. Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 305-3900**.

24. The following list is the Examiner's field of search for the present Office Action:

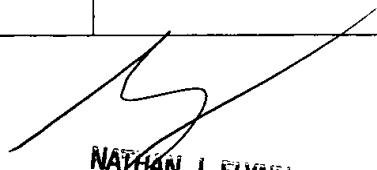
| Field of Search | Date |
|---|-------|
| U.S. Class / Subclass (es): 257/691,778; 174/256, 266 | 04/03 |
| Other Documentation: | |
| Electronic Database(s): East (USPAT, US PGPUB, JPO, EPO, Derwent, IBM TDB) | 04/03 |

Leonardo Andújar

Patent Examiner Art Unit 2826

LA

4/19/03


NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800